

Instructional Framework

Construction Technologies

46.0400.20



This Instructional Framework identifies, explains, and expands the content of the standards/measurement criteria, and, as well, guides the development of multiple-choice items for the Technical Skills Assessment. This document corresponds with the Technical Standards endorsed on October 9, 2019.

Domain 1: Safety Tools and Applied Math	
Instructional Time: 35 - 45 %	
STANDARD 1.0 MAINTAIN A SAFE WORK ENVIRONMENT [in accordance with OSHA (Occupational Safety and Health Administration)]	
1.1 Explain the content and the purpose of SDSs (Safety Data Sheets)	<ul style="list-style-type: none">● Safety Data Sheet (SDS)● Physical properties of the product● Chemical properties of the product● Manufacturer responsibilities
1.2 Use basic protective equipment (PPE) appropriate for the job	<ul style="list-style-type: none">● Personal Protective Equipment (PPE)● Hard hats● Gloves● Safety vests● Work boots● Safety glasses● Fall protection
1.3 Explain types of fires and the appropriate use of fire extinguishers	<ul style="list-style-type: none">● Class A, B, C, D fires● Class A, B, C, D extinguishers● Pull Aim Squeeze Sweep (PASS)● Extinguisher location
1.4 Maintain worksite safety and housekeeping, including a safety plan for emergency situations	<ul style="list-style-type: none">● Proper lighting● Trip hazards● Awareness of surroundings● Safety plan● Disposal of waste● Proper housekeeping
1.5 Describe situations requiring first-aid and emergency care; apply basic first-aid techniques	<ul style="list-style-type: none">● Establish first-aid procedures● Location of first-aid kits

	<ul style="list-style-type: none"> ● First-aid course by certified instructor
1.6 Practice appropriate procedures for lifting heavy objects	<ul style="list-style-type: none"> ● Wide base ● Squat ● Posture ● Hold ● Straight back ● No twisting ● Eyes ahead
1.7 Recognize common fall hazards and employer requirements to protect workers from falls	<ul style="list-style-type: none"> ● Unprotected edges ● Barricades ● Safety nets ● Safety harness ● Scaffolding
1.8 Recognize caught-in or caught-between hazards and employer requirements to protect workers from caught-in or caught-between hazards	<ul style="list-style-type: none"> ● Caught, crushed, squeezed, compressed or pinched between two or more objects ● Unguarded piece of machinery ● Buried by trench cave-ins ● Getting pinned
1.9 Demonstrate safe work procedures around electrical hazards	<ul style="list-style-type: none"> ● De-energize machinery/circuits ● Follow lockout/tagout procedures ● Inspect before use
1.10 Recognize correct procedures for lockout/tagout	<ul style="list-style-type: none"> ● Shut down equipment ● De-energize ● Verify shutdown ● Force lockdown (padlock, tags)
1.11 Identify procedures for reporting safety hazards	<ul style="list-style-type: none"> ● OSHA reporting procedures
STANDARD 2.0 RECOGNIZE HAND AND POWER TOOLS AND EQUIPMENT	
2.1 Identify and inspect hand tools	<ul style="list-style-type: none"> ● Identify tools with proper and common name ● Identify appropriate tool for job or task ● Inspect tools for damage (sharpen chisels, etc.)
2.2 Identify and inspect portable power tools, powder-actuated tools, pneumatic tools, and extension cords	<ul style="list-style-type: none"> ● Identify tools with proper and common name ● Proper working order for tools (check for damage cords, sharp blades)

	<ul style="list-style-type: none"> ● Pneumatic tool use (lubricated and air PSI)
2.3 Refer to user manuals and manufacturer's guidelines for how to use and maintain hand and power tools and equipment	<ul style="list-style-type: none"> ● Identify maintenance procedures
STANDARD 3.0 USE APPLIED MATHEMATICS AND MEASUREMENTS	
3.1 Perform measurements	<ul style="list-style-type: none"> ● Read a tape measure to a 16th of an inch ● Convert from tenths of a foot to feet and inches ● Convert feet and inches to scale
3.2 Explain conversion from metric to imperial	<ul style="list-style-type: none"> ● Calculate length ● Calculate area ● Calculate volume ● Calculate mass
3.3 Perform calculations (e.g., add and subtract fractions in feet and inches and convert fractions to decimals and decimals to fractions)	<ul style="list-style-type: none"> ● Add and subtract fractions in feet and inches ● Convert fractions to decimals ● Convert decimals to fractions

Domain 2: Residential Construction Applications

Instructional Time: 25 - 35%

STANDARD 5.0 RECOGNIZE SITE AND BUILDING LAYOUT

5.1 Describe the use and care of standard measuring instruments	<ul style="list-style-type: none"> ● Tape measure ● Laser ● Total station ● Builder's level ● Theodolite
5.2 Explain building lines and recognize trade-specific layout	<ul style="list-style-type: none"> ● Plumbing ● Electrical ● Mechanical
5.3 Explain a builder's level or transit and differential leveling procedures to determine site and building elevations	<ul style="list-style-type: none"> ● Measure to a 16th of an inch ● Correct use of a transit/laser level ● Comprehend a tape measure ● Use of squares (i.e., framing, speed, etc.)

STANDARD 6.0 PERFORM MASONRY WORK

6.1 Describe basic masonry units	<ul style="list-style-type: none">● Concrete Masonry Unit (CMU)● Bond beam● Rebar● Mortar● Grout
6.2 Describe the components/accessories of a masonry wall	<ul style="list-style-type: none">● Wall ties● Horizontal ladders● Rebar positioners
6.3 Describe the components of mortar and grout and how to properly mix mortar and grout	<ul style="list-style-type: none">● Mixture ratio● Sand, water, cement● Colorizing agents
6.4 Demonstrate proper use of tools for masonry	<ul style="list-style-type: none">● Trowel● Sled runner● Soft brush● Brick hammer● Tape measure● Mason line● Line block● Line trigs● Marking crayons● Chalk line● Mason level● Margin trowel● Wire cutters● Sharpie● Saw wrench● Construction calculator● Folding rule● Saw
6.5 Use a level to evaluate masonry work	<ul style="list-style-type: none">● Level● Plum● Square● Straight
6.6 Lay brick/block to specification	<ul style="list-style-type: none">● Perform masonry work

	<ul style="list-style-type: none"> ● Estimate block or brick quantity
STANDARD 7.0 LAY OUT AND INSTALL FLOOR AND CEILING FRAMING	
7.1 Identify components of floor systems (i.e., wood, steel metal deck, etc.)	<ul style="list-style-type: none"> ● Wood ● Steel ● Metal deck
7.2 Explain Ceiling components and accessories for a frame building	<ul style="list-style-type: none"> ● Floor joists ● Subflooring ● Exterior walls ● Interior support wall ● Frames and stairs ● Door ● Roof rafters ● Trusses ● Sheathing the roof
7.3 Describe the procedure for setting posts	<ul style="list-style-type: none"> ● Post hole diameter ● Depth of the hole ● 6 inches of gravel ● Set and plumb post
7.4 Describe the correct fasteners used in construction of floor systems	<ul style="list-style-type: none"> ● Nail size and screw size ● Fastener spacing ● Clips and hangers
7.5 Calculate the amount of material needed to frame a floor assembly	<ul style="list-style-type: none"> ● Material estimate ● Linear feet calculated ● Area, perimeter, volume
7.6 Lay out and construct floor systems	<ul style="list-style-type: none"> ● Squaring techniques ● 3:4:5 Triangle ● Chalk line ● Marking material
STANDARD 8.0 DEMONSTRATE WALL FRAMING	
8.1 Lay out wall lines including plates, corner posts, door and window openings, partition Ts, bracing, and fire stops	<ul style="list-style-type: none"> ● Chalk line method ● Mark material
8.2 Assemble wood and metal stud walls	<ul style="list-style-type: none"> ● Advantages of wood vs metal

	<ul style="list-style-type: none"> ● Fastening methods used for wood vs metal
8.3 Assemble, erect, and brace exterior walls for a frame building	<ul style="list-style-type: none"> ● Shear wall ● Strapping ● Anchoring ● Dry in method
8.4 Calculate the materials required to frame walls	<ul style="list-style-type: none"> ● Bill of materials ● Determine area, volumes, perimeters, cost of materials ● Determine amount of waste and overage
STANDARD 9.0 DEFINE ROOF FRAME AND FINISH	
9.1 Recognize components of roof framing and finishing	<ul style="list-style-type: none"> ● Crickets ● Scuppers ● Penetrations ● Truss
9.2 Recognize types and styles of sheathing and coverings	<ul style="list-style-type: none"> ● Flat ● Tile ● Shingles
9.3 Illustrate a roof opening	<ul style="list-style-type: none"> ● Flashing ● Apron ● Vapor barrier
9.4 Define Parapet	<ul style="list-style-type: none"> ● Low wall (i.e., roof of a building, edge of a balcony, etc.)
9.5 Estimate the materials used in framing and sheathing a roof	<ul style="list-style-type: none"> ● Spans ● Materials ● Sizing
STANDARD 16.0 PERFORM CONCRETE WORK	
16.1 Review the history and uses of concrete and tools	<ul style="list-style-type: none"> ● Footings ● Flatwork ● Post-tensions ● Walls ● Tilt-ups ● Bull float ● Darby float

16.2 Describe the components of concrete	<ul style="list-style-type: none"> ● Formwork ● Aggregates ● Grading ● Rebar ● Wire mesh ● Admixtures ● Slump
16.3 Describe types of finishes	<ul style="list-style-type: none"> ● Broom ● Troweled ● Stamped ● Mag
16.4 Prepare, place, and finish concrete	<ul style="list-style-type: none"> ● Mixers ● Forms ● Concrete tools (i.e., trowels, bull floats, etc.)

Domain 3: Applied Sciences, HVAC, Plumbing and Electrical
Instructional Time: 15 - 20%

STANDARD 10.0 IDENTIFY ENVIRONMENTAL COMPONENTS IN BUILDING ENVELOPE AND OCCUPIED SPACES

10.1 Identify types and use of thermal insulation, vapor barriers, R-values, and U-values	<ul style="list-style-type: none"> ● Advantages and disadvantages of different types of thermal insulation (i.e., glass fiber vs plastic foam, etc.) ● Purpose of vapor barrier ● R-values vs U-values ● Outside door vs inside door
10.2 Describe the function of an HVAC system	<ul style="list-style-type: none"> ● Fan ● Condenser coil ● Compressor ● Refrigerant ● Blower motor ● Evaporator ● Circuit board ● Filter ● Thermostat ● Supply vent ● Return air vent

10.3 Describe various types of energy efficient systems	<ul style="list-style-type: none"> ● Solar electricity ● Solar water heating ● Cocoon insulation systems ● Gray water systems ● Turbines ● Economization ● Variable Refrigerant Flow (VRF) ● Multi-speed and variable speed motors
STANDARD 13.0 ASSEMBLE PIPING, WASTE, AND VENT DISTRIBUTION SYSTEMS	
13.1 Identify the major components of a drainage and water distribution system	<ul style="list-style-type: none"> ● Potable water ● Sewage line ● Grey water ● Black water ● Alternative water heating
13.2 Assemble a soil, waste, and vent system	<ul style="list-style-type: none"> ● Plumbing fixtures (i.e., P-trap, J-trap, J-bend, etc.) ● Rise, run and slope ● Sewage gas ● Drain, Waste, Vent (DWV) System ● Uniform Plumbing Code (UPC)
13.3 Assemble a water distribution system	<ul style="list-style-type: none"> ● Supply line pipe sizes ● Supply line materials ● Assembly equipment needed ● Pipe assembly technique (crimp, sweating, glue, push to connect, expansion) ● Uniform Plumbing Code (UPC)
13.4 Explain the function of plumbing fixtures and equipment	<ul style="list-style-type: none"> ● Water heater ● Valves ● Clean outs ● Faucet insulation ● Toilets ● Water hammer suppression
13.5 Measure, cut, and join plastic and copper piping	<ul style="list-style-type: none"> ● Assemble pipes ● Cut PVC, copper, etc. ● Sweat copper fittings ● Glue PVC fittings

13.6 Describe the functions of a drainage and water system and how they malfunction	<ul style="list-style-type: none"> ● Rise, run, slope and Pressure ● Size of pipe ● Installation ● Water waste flow ● Air flow
13.7 Identify how an efficient system affects water usage	<ul style="list-style-type: none"> ● Control ● Leaks ● Reclaimed water usage
STANDARD 14.0 INSTALL ELECTRICAL COMPONENT/SYSTEM(S)	
14.1 Recognize basic electrical theory	<ul style="list-style-type: none"> ● National Electric Code (NEC) ● Volts, watts, amps ● Grounding
14.2 Reference the NFPA 70E standards	<ul style="list-style-type: none"> ● Standard for electrical safety in the workplace ● National Electric Code (NEC)
14.3 Identify materials	<ul style="list-style-type: none"> ● Wire type and size (gauge, wire count) ● Light switches (single pole, three way, dimmers) ● Wire material (copper, aluminum, etc.) ● Outlet types (15-amp, 20-amp, GFCI, etc.) ● Junction boxes (inside use, outside use) ● Wire protection (metal conduit, plastic conduit, wire sleeve, etc.)
14.4 Rough in electrical enclosures	<ul style="list-style-type: none"> ● Breaker box ● Circuit breaker box ● Gang box type (single, double, round, metal, plastic, etc.) ● Gang boxes (new construction, existing construction) ● Conduit fabrication, wire pulling, raceway, and box capacity and cable
14.5 Define conductor properties	<ul style="list-style-type: none"> ● Grounding ● Wire material (aluminum, copper) ● Wire insulation ● Conductor sizing
14.6 Demonstrate the termination of electrical devices, appliances, light fixtures (luminaires), and ceiling fans	<ul style="list-style-type: none"> ● Install outlets ● Install lights

	<ul style="list-style-type: none"> ● Install 220 appliances
14.7 Recognize various types of electrical systems	<ul style="list-style-type: none"> ● Three-phase ● Single-phase ● Medium voltage ● Low voltage ● Etc.

Domain 4: Stairs, Interior and Exterior Trim and Finishes Instructional Time: 5 - 10%	
STANDARD 11.0 APPLY EXTERIOR FINISHES	
11.1 Identify frieze boards or soffit	<ul style="list-style-type: none"> ● Advantages or disadvantages of frieze board or soffit ● Common types of frieze board or soffit
11.2 Identify exterior moldings and trim	<ul style="list-style-type: none"> ● Common types of molding and trim
11.3 Identify various types of siding	<ul style="list-style-type: none"> ● Common types of siding (stucco, tongue and groove, shiplap, brick, etc.)
11.4 Explain installation of various finishes	<ul style="list-style-type: none"> ● Stucco ● Siding ● Soffits
STANDARD 12.0 APPLY INTERIOR TRIM AND STAIRS	
12.1 Determine the number and sizes of risers and treads required for a stairway	<ul style="list-style-type: none"> ● Sizes ● Risers ● Treads
12.2 Build a small stair unit	<ul style="list-style-type: none"> ● Calculate area
12.3 Explain and identify types of millwork (i.e., cabinets, moldings, casings, baseboards, etc.)	<ul style="list-style-type: none"> ● Cabinets ● Moldings ● Casings ● Baseboards

STANDARD 15.0 INSTALL INTERIOR WALL AND CEILING FINISH

15.1 Identify types of wall and ceiling finishes	<ul style="list-style-type: none">● Drywall● Paint● Texture type● Acoustical Ceiling Tile (ACT)
15.2 Identify finishing tools	<ul style="list-style-type: none">● Trowel● Silica● Sanders● Mud-pan● Screw guns● Etc.
15.3 Recognize the proper techniques for handling, staging, storing, and cutting drywall and drywall materials	<ul style="list-style-type: none">● Razor blade/knife score and snap technique● Drywall saw● Drywall files● Drywall thickness● Drywall lifts● Proper storage practice (vertical storage, horizontal storage)● Silica awareness
15.4 Fasten drywall to walls	<ul style="list-style-type: none">● Lifting methods (hangman, drywall lift, etc.)● Nailing/screwing procedures● Types of fasteners● Furring techniques
15.5 Demonstrate proper finishing techniques	<ul style="list-style-type: none">● Weights of joint compound (MUD)● Types of MUD (premix, dried, etc.)● Types of tape (paper vs fiberglass)
15.6 Demonstrate proper material use and methods of paint application	<ul style="list-style-type: none">● Application types (spray, roll, brush, etc.)● Types of paint (latex, clear, enamels, primer, etc.)

Domain 5: Blueprints and Plans

Instructional Time: 5 - 10 %

STANDARD 4.0 USE CONSTRUCTION DOCUMENTS

4.1 Identify terms relating to plans and drawings	<ul style="list-style-type: none">● On Center (O.C.)● Symbol for Inches (")● Symbol for Feet (')● Architectural scale● Above Floor Finish (AFF)● Width, High, Length (W x H x L)● Disposal (DISP)● Dishwasher (DW)● Wood (WD)● Not to Scale (N.T.S)
4.2 Identify symbols relating to plans and drawings	<ul style="list-style-type: none">● Blueprint legend (notes)● Electrical● Framing, roofing pitch● Plumbing● Drawing scale● Mechanical● Line types (extension, cut, dimension, etc.)
4.3 Identify plans and drawings scales (i.e., 1/2" = 1'.0", 3/4" = 1'.0", N.T.S., etc.)	<ul style="list-style-type: none">● 1/2" = 1'.0"● 3/4" = 1'.0"● Not To Scale (N.T.S.)
4.4 Recognize notes and material schedules	<ul style="list-style-type: none">● Key notes● General Structural Notes (GSN)
4.5 Relate information on plans and drawings to actual locations	<ul style="list-style-type: none">● Surveying● Scheduling/placing (location of rough openings etc.)
4.6 Identify and use drawing dimensions	<ul style="list-style-type: none">● Scaling● Types of scale (1/4 inch = 1 foot)● Converting between scales
4.7 Explain the importance of and resources for building codes	<ul style="list-style-type: none">● National Electric Code (NEC)● International Building Code (IBC)

	<ul style="list-style-type: none">● Universal Plumbing Code (UPC)
4.8 Describe types of technology used in construction management (i.e., smartphones and mobile apps to drones and robots)	<ul style="list-style-type: none">● Computer Aided Design (CAD)● Global Positioning Satellite (GPS)● Lasers● Drones● Software (scheduling, budgeting, electrical loads, blueprint reading apps)

